

REMARKS

Claims 1-13, 18, and 21 are pending in the present application. Claims 14-17 are canceled; claims 1-4, 6, 7, 9, and 11-13 are amended; claim 21 is added; and claims 19 and 20 are withdrawn from consideration. Support for the claim amendments may be found in Figure 6 and in the specification on p. 13, ll. 15-30. Reconsideration of the claims is respectfully requested.

I. Election/ Restriction

The examiner issued a restriction requirement for the claims in group I, including claims 1-18, and group II, including claims 19 and 20. Timothy Shulte made a preliminary election of group I on March 7, 2005. The examiner requires affirmation of this election. The claims in group I are elected without traverse.

II. 35 U.S.C. § 112, Second Paragraph

The examiner rejects claims 1-18 as indefinite. These claims have amended accordingly. Therefore the rejection of claims 1-18 under 35 U.S.C. § 112, second paragraph has been overcome.

III. 35 U.S.C. § 102, Anticipation

The examiner rejects claims 1, 2, 6-12 and 16-18 as anticipated by *Min et al., Method of Forming a Continuous Free Layer Spin Valve Sensor with Patterned Exchange Underlayer Stabilization*, U.S. Patent 6,606,782, August 19, 2003 (Hereinafter "*Min*"). This rejection is respectfully traversed.

As to claims 1, 2, 6-12 and 16-18, the Office Action states:

Regarding claims 1 and 11, *Min et al.* disclose a MR sensor (Title) comprising a plurality of sensor stack layers (Figure 5E); and at least one depression (i.e. applicants' "stabilizer depression") formed in one sensor stack layer within the plurality of sensor stack layers (Figure 5E, area marked as 7W).

The limitation "wherein the at least one stabilizer depression imparts a restorative force on a magnetic field of a free layer of the magnetoresistive sensor to align the magnetic field with a bias direction" is a functional limitation(s). As defined in the MPEP, "[a] functional limitation is an attempt to define something by what it does, rather than by

what it is (e.g., as evidenced by its specific structure or specific ingredients). There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper. *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971)—MPEP § 2 173.05(g). However, the examiner notes that “where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristics relied on” (emphasis added) - MPEP § 2183.

In the instant case, the claimed limitation(s) “wherein the at least one stabilizer depression ... with a bias direction” is a functional limitation(s) and is deemed to be an inherent characteristic of the prior art since the prior art is substantially identical in composition and/or structure. The examiner's sound basis for this assertion is the comparison of the layer and structure order in applicants' Figures 7 and 8 to *Min et al.* Figure 5E.

Office Action of Jul. 5, 2005, pp. 5-6.

A prior art reference anticipates the claimed invention under 35 U.S.C. § 102 only if every element of a claimed invention is identically shown in that single reference, arranged as they are in the claims. *In re Bond*, 910 F.2d 831, 832, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990). All limitations of the claimed invention must be considered when determining patentability. *In re Lowry*, 32 F.3d 1579, 1582, 32 U.S.P.Q.2d 1031, 1034 (Fed. Cir. 1994). Anticipation focuses on whether a claim reads on the product or process a prior art reference discloses, not on what the reference broadly teaches. *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 218 U.S.P.Q. 781 (Fed. Cir. 1983). In this case each and every feature of the presently claimed invention is not identically shown in the cited reference, arranged as they are in the claims.

Regarding claims 6, 7, 9, and 10, these claims now depend from claim 3, as amended. Claim 3 maintains all of the features of original claim 3. Therefore, as the examiner apparently believes, *Min* does not anticipate these claims.

Regarding claims 16 and 17, these claims have been canceled. Therefore, the rejection with regard to these claims has been rendered moot.

Regarding claim 1, amended claim 1 is as follows:

1. A magnetoresistive sensor, comprising:
an antiferromagnetic layer;
a non-magnetic spacer layer;
a pinned layer disposed between the antiferromagnetic layer and

the non-magnetic spacer layer, wherein the pinned layer is further adjacent to both the antiferromagnetic layer and the non-magnetic spacer layer;
 a free layer disposed adjacent to the non-magnetic spacer layer;
 a gap layer operatively disposed with respect to the antiferromagnetic layer, the non-magnetic spacer layer, the pinned layer, and the free layer;
 a permanent magnet layer operatively disposed with respect to the antiferromagnetic layer, the non-magnetic spacer layer, the pinned layer, and the free layer, and the gap layer; and
 at least one stabilizer depression formed in at least one of the antiferromagnetic layer, the non-magnetic spacer layer, the pinned layer, the free layer, and the gap layer, wherein the at least one stabilizer depression does not extend into the permanent magnet layer, and wherein the at least one stabilizer depression imparts a restorative force on a magnetic field of a free layer of the magnetoresistive sensor to align the magnetic field with a bias direction.

As amended, claim 1 includes the feature that the at least one stabilizer depression does not extend into the permanent magnet layer. *Min* does not show this claimed feature. Therefore, *Min* does not anticipate claim 1.

Min shows the following structure in figure 5E, which is cited by the examiner:

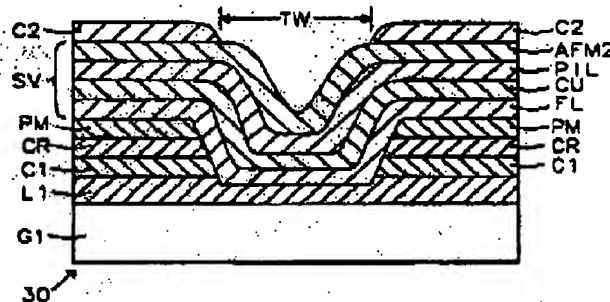


FIG. 5E

In this figure, G1 is the gap layer, L1 is the metal under layer, C1 is the optional conductor layer, CR is the chromium layer, PM is a permanent magnet, C2 is a patterned conductor, and SV is the spin valve stack, which includes free layer FL, copper layer CU, pinned layer PIL, and antiferromagnetic layer AFM2. Figure 5E of *Min* shows that the depression cited by the examiner extends into and past the permanent magnet layer. Claim 1 as amended contains the feature that the at least one stabilizer depression does not extend into the permanent magnet layer. Similarly, nothing else in *Min* shows the claimed structure. Thus, *Min* does not anticipate claim 1.

Amended claim 11 recites similar features as claim 1. *Min* does not anticipate claim 11 for the same reasons that *Min* does not anticipate claim 1. *Min* does not anticipate claim 3 for the reasons provided above. The remaining dependent claims all depend from claim 1, claim 3, or claim 11. Thus, *Min* does not anticipate any of the dependent claims at least by virtue of their dependence on the independent claims. Additionally, the dependent claims claim other additional combinations of features not suggested by the reference. For example, *Min* does not show wherein the free layer is disposed adjacent the spacer layer and opposite the gap layer such that the magnetoresistive sensor forms a bottom spin valve sensor, as claimed in claim 21. Thus, *Min* does not anticipate any of the claims as amended. Consequently, it is respectfully urged that the rejection of claims 1, 2, 6-12, and 16-18 have been overcome.

Furthermore, *Min* does not teach, suggest, or give any incentive to make the needed changes to reach the presently claimed invention. Absent the examiner pointing out some teaching or incentive to implement *Min* and the claimed layer structure, one of ordinary skill in the art would not be led to modify *Min* to reach the present invention when the reference is examined as a whole. Absent some teaching, suggestion, or incentive to modify *Min* in this manner, the presently claimed invention can be reached only through an improper use of hindsight using Applicants' disclosure as a template to make the necessary changes to reach the claimed invention.

IV. 35 U.S.C. § 102, Anticipation

The examiner rejects claims 1-18 as anticipated by *Hasegawa et al.*, Magnetic Sensor Having Free Layer Additionally Provided with Magnetic Anisotropy by Shape Anisotropy, U.S. Patent Application Publication 2004/0067389, April 8, 2004 (Hereinafter "*Hasegawa*"). This rejection is respectfully traversed.

As to claims 1-18, the Office Action states:

Regarding claims 1 and 11, *Hasegawa et al.* disclose a MR sensor (Title) comprising a plurality of sensor stack layers (Figure 2); and at least one depression (i.e. applicants' "stabilizer depression") formed in one sensor stack layer within the plurality of sensor stack layers (Figure 2, area marked as C(Tw)).

The limitation "wherein the at least one stabilizer depression imparts a restorative force on a magnetic field of a free layer of the magnetoresistive sensor to align the magnetic field with a bias direction" is a functional limitation(s). As defined in the MPEP, "[a] functional

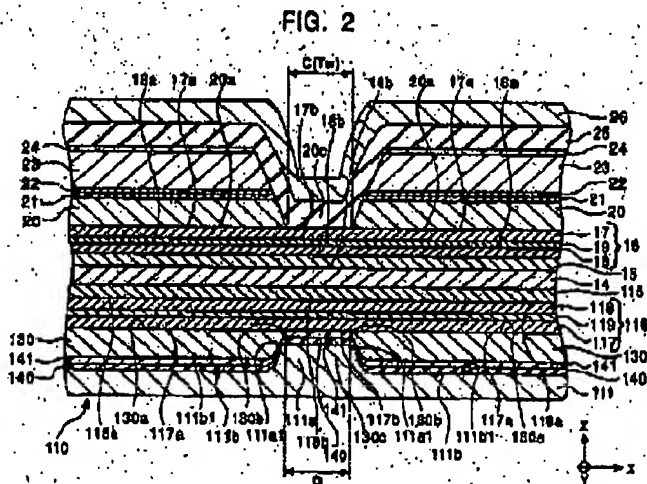
limitation is an attempt to define something by what it does, rather than by what it is (eg., as evidenced by its specific structure or specific ingredients). There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper. In *re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971)—MPEP § 2 173.05(g). However, the examiner notes that “where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristics relied on” (emphasis added) - MPEP § 2183.

In the instant case, the claimed limitation(s) “wherein the at least one stabilizer depression ... with a bias direction” is a functional limitation(s) and is deemed to be an inherent characteristic of the prior art since the prior art is substantially identical in composition and/or structure. The examiner’s sound basis for this assertion is that the depression formed by *Hasegawa et al.* is specifically to influence the biasing ability of the sensor (Paragraphs 0025 — 0033 and 0103 — 0106).

Office Action of Jul. 5, 2005, pp. 7-8.

Regarding claims 14 through 17, these claims have been canceled. Therefore the rejection of these claims in view of *Hasegawa* is moot.

Regarding claims 1 and 11 as amended, *Hasegawa* does not anticipate claims 1 and 11 because *Hasegawa* does not show the claimed feature that the at least one stabilizer depression does not extend into the permanent magnet layer. Figure 2 of *Hasegawa*, cited by the examiner, is as follows:



In figure 2 of *Hasegawa*, the spin valve sensor is made of layers 116 (second fixed magnetic layer), 115 (non-magnetic layer), 14 (free layer), 15 (non-magnetic layer), and 16 (first fixed magnetic layer). The other layers are not part of the spin valve sensor. Below the spin valve sensor, layer 130 is an antiferromagnetic layer, layer 141 is the seed layer, layer 140 is a lower gap layer, and layer 111 is the lower shield layer. Above the spin valve sensor, layer 20 is an antiferromagnetic layer, layer 21 is the stop layer, layer 22 is a protection layer, layer 23 is an electrode layer, layer 24 is a protection layer, layer 25 is an upper gap layer, and layer 26 is the upper shield layer.

In all of the layers shown in the overall sensor 110, none of the layers show that the depression does not extend into permanent magnet layer 116 or permanent magnet layer 16. No other permanent magnet layers are shown. Furthermore, nothing else in *Hasegawa* shows a depression extending into a permanent magnet layer. Thus, *Hasegawa* does not show the claimed feature that the at least one stabilizer depression does not extend into the permanent magnet layer. Accordingly, *Hasegawa* does not anticipate claim 1. Claim 11 contains similar features to claim 1. Therefore, *Hasegawa* does not anticipate claim 11 for the reasons presented vis-à-vis claim 1. For similar reasons *Hasegawa* does not anticipate claims 2, 8, 12, 13, 18, and 21 at least by virtue of their dependence on claim 1.

Regarding claim 3, claim 3 as amended is as follows:

3. A magnetoresistive sensor, comprising:
a plurality of sensor stack layers, wherein at least one of the plurality of sensor stack layers is a free layer and at least one of the plurality of sensor stack layers is a pinned layer; and
at least one stabilizer depression formed in one sensor stack layer within the plurality of sensor stack layers, wherein the at least one stabilizer depression imparts a restorative force on a magnetic field of a free layer of the magnetoresistive sensor to align the magnetic field with a bias direction;
wherein the magnetoresistive sensor is a bottom spin valve sensor.

Hasegawa does not show the claimed feature that the magnetoresistive sensor is a bottom spin valve sensor. The examiner asserts otherwise, stating that:

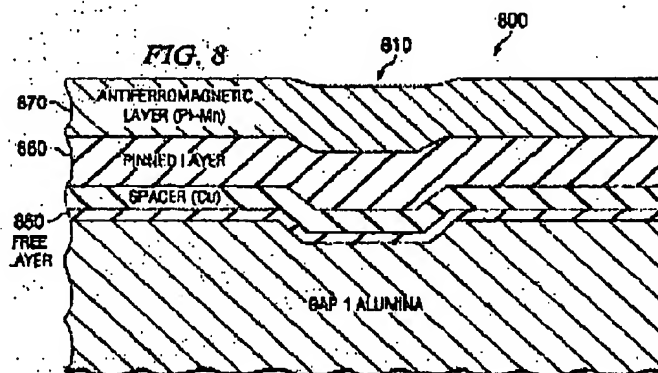
Regarding claims 2, 3, 12, and 13, *Hasegawa* et al. disclose depressions formed for both "top" and "bottom" spin valve sensor structures (i.e. pinned layers (elements 16 and 116) are on top and bottom of free layer (element 14)).

Office Action of July 5, 2005, p. 8.

However, the examiner's characterization of the layers shown in *Hasegawa* and vis-à-vis claim 3 is incorrect. As shown above, layers 16 and 116 are fixed magnetic layers. Assuming, arguendo, that layers 16 and 116 are both pinned layers as claimed, then two pinned layers are present, not one as claimed. Pinned layers, 16, is on the "top" of the sensor and the other pinned layer, 116, is on the "bottom" of the sensor. However, a "bottom spin valve sensor" is defined as follows in the specification (Applicants are entitled to be their own lexicographers such that claim terms are defined by the specification, see MPEP § 2111.01 and *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994)):

A top spin valve sensor 700 and a bottom spin valve sensor 800 are essentially inverted versions of one another with the pinned layer 710, 860 on either the "top" for a top spin valve sensor, or the "bottom" for a bottom spin valve sensor.

As further shown in Figure 8 of the present application, the bottom spin valve sensor is as follows:



For the "bottom" spin valve sensor, free layer 850 is between the gap layer and pinned layer 860. Had free layer 850 been opposite the gap layer relative to pinned layer 860, then a "top" spin valve sensor would be formed, as shown in Figure 7. For the "bottom" spin valve sensor, the pinned layer is "below" the free layer, relative to the gap layer. For the "top" spin valve sensor, the pinned layer is "above" the free layer, relative to the gap layer. However, for both the "bottom" and the "top" spin valve sensor, only one pinned layer is present. In *Hasegawa*, the "pinned layers" 16 and 116 are in *both* locations, "above" and "below" the free layer. Placing pinning layers in both locations creates a magnetic sensor entirely different than that claimed. In other words, the sensor

shown in *Hasegawa* is neither a "top spin valves sensor" nor a "bottom spin valve sensor," but rather something else entirely. One of ordinary skill would not interpret a magnetic sensor having pinned layers both "above" and "below" the free layer to be either a "top" spin valve sensor or a "bottom" spin valve sensor. For this reason, *Hasegawa* does not show the claimed feature that the magnetoresistive sensor is a bottom spin valve sensor.

Further regarding claim 3, *Hasegawa* does not show the claimed feature of at least one stabilizer depression formed in one sensor stack layer within the plurality of sensor stack layers. As shown above, the spin valve sensor in *Hasegawa* consists of layers 14, 15, 16, and 116. However, the depression in *Hasegawa* does not extend into any of these layers. The remaining layers do not form a sensor stack layer, as claimed. Therefore, *Hasegawa* does not show this feature of claim 3.

Hasegawa does not show all of the features of claim 3, as shown above. Thus, *Hasegawa* does not anticipate claim 3. Because claims 4-7, 9, and 10 depend from claim 3, the same distinctions between *Hasegawa* and the invention of claim 3 can be made for these claims. Additionally, claims 4-7, 9, and 10 claim other additional combinations of features not suggested by the reference. For example, *Hasegawa* does not show the feature that the at least one stabilizer depression is formed under a permanent magnet, as claimed under claim 7. Consequently, it is respectfully urged that the rejection of claims 3-7, 9 and 10 have been overcome.

Hasegawa does not show all of the features of any of the claims as amended. Therefore, the rejection of claims 1-18 under 35 U.S.C. § 102 has been overcome.

Furthermore, *Hasegawa* does not teach, suggest, or give any incentive to make the needed changes to reach the presently claimed invention. Absent the examiner pointing out some teaching or incentive to implement *Hasegawa* and the inventive features of claim 3, one of ordinary skill in the art would not be led to modify *Hasegawa et al.* to reach the present invention when the reference is examined as a whole. Absent some teaching, suggestion, or incentive to modify *Hasegawa* in this manner, the presently claimed invention can be reached only through an improper use of hindsight using Applicants' disclosure as a template to make the necessary changes to reach the claimed invention.

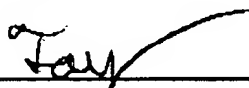
V. Conclusion

It is respectfully urged that the subject application is patentable over *Min* and *Hasegawa* and is now in condition for allowance.

The examiner is invited to call the undersigned at the below-listed telephone number if in the opinion of the examiner such a telephone conference would expedite or aid the prosecution and examination of this application.

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Respectfully submitted,



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